



**FACULTY OF ELECTRICAL ENGINEERING
AND INFORMATION SCIENCE**



**INFORMATION TECHNOLOGY AND
ELECTRICAL ENGINEERING -
DEVICES AND SYSTEMS,
MATERIALS AND TECHNOLOGIES
FOR THE FUTURE**

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I. Hörselmann

Frequency Response of Transconductance on OFETs with Different Contact Designs

Functional Electrical and Electronic Materials and Devices

We prepared organic field effect transistor with spin coated poly3hexylthiophene (P3HT) as semiconductor material. Silicon dioxide was used as gate insulator. The source- and drain contacts were realized gold evaporated through a shadow mask. On the same sample we realized two different transistor designs, bottom contact (BOC) and top contact (TOC). The two transistor design were investigated by static measurements. Figure 1 shows the transfer characteristics for the two designs in linear and saturation mode. From the transfer characteristic we estimated the value of the transconductance (figure 2). In a next step we measured the frequency response of the transconductance comparing the two different designs. The frequency response of the transconductance were measured for different gate voltages in linear and saturation regime.

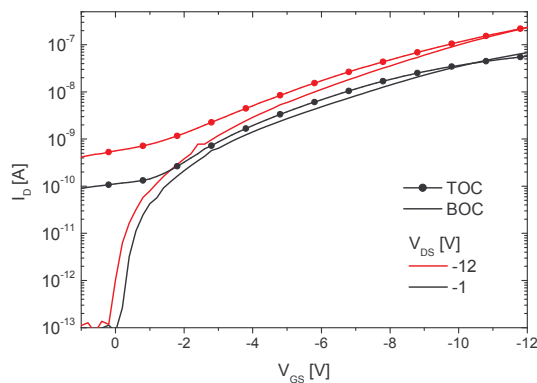


Figure 1: measured transfer characteristic

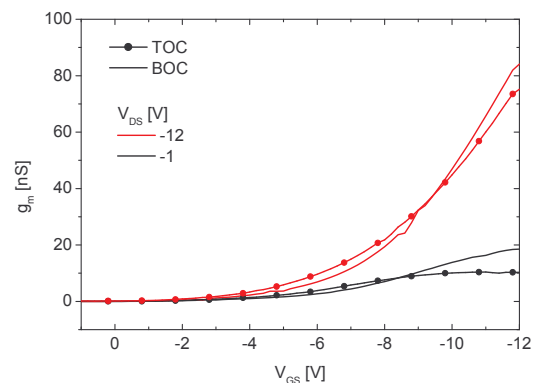


Figure 2: transconductance derived from the transfer characteristic

The differences in frequency resonance of the transconductance are notiable in the comparisation of the phase in figure 3 and 4. The top contact structure shows in the linear transistor regime an additional phase shift in the transconductance above the cut-off frequency

We compare the measurement results with two dimensional device simulations.

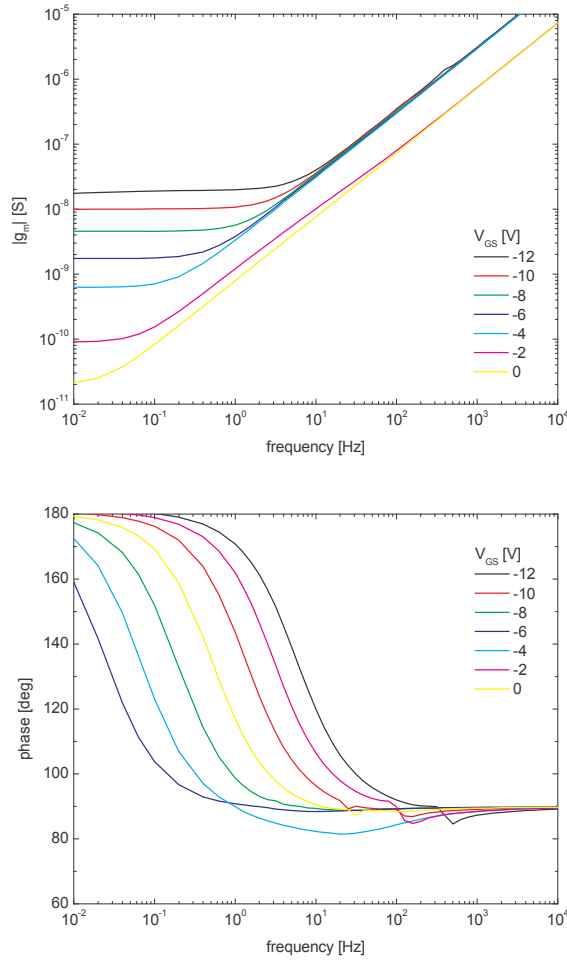


Figure 1: BOC transistor, transconductance frequency response $V_{DS}=-1V$

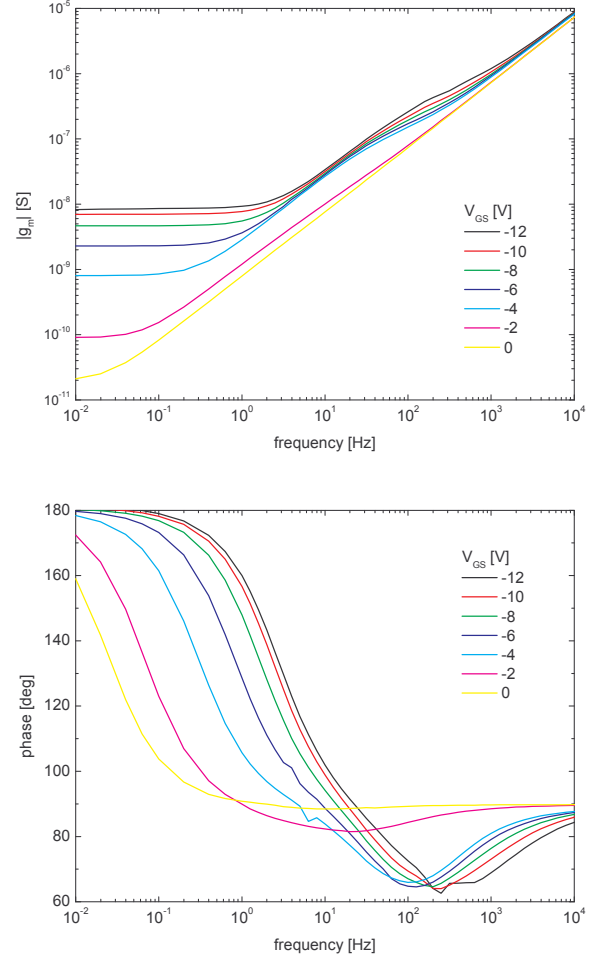


Figure 2: TOC transistor, transconductance frequency response $V_{DS}=-1V$

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